Epigenetics and cardiovascular development.

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Public Summary:
This article reviews the epigenetic mechanism of cardiovascular development.

Scientific Abstract:
The cardiovascular system is broadly composed of the heart, which pumps blood, and the blood vessels, which carry blood to and from tissues of the body. Heart malformations are the most serious common birth defect, affecting at least 2% of newborns and leading to significant morbidity and mortality. Severe heart malformations cause heart failure in fetuses, infants, and children, whereas milder heart defects may not trigger significant heart dysfunction until early or midadulthood. Severe vasculogenesis or angiogenesis defects in embryos are incompatible with life, and anomalous arterial patterning may cause vascular aberrancies that often require surgical treatment. It is therefore important to understand the underlying mechanisms that control cardiovascular development. Understanding developmental mechanisms will also help us design better strategies to regenerate cardiovascular tissues for therapeutic purposes. An important mechanism regulating genes involves the modification of chromatin, the higher-order structure in which DNA is packaged. Recent studies have greatly expanded our understanding of the regulation of cardiovascular development at the chromatin level, including the remodeling of chromatin and the modification of histones. Chromatin-level regulation integrates multiple inputs and coordinates broad gene expression programs. Thus, understanding chromatin-level regulation will allow for a better appreciation of gene regulation as a whole and may set a fundamental basis for cardiovascular disease. This review focuses on how chromatin-remodeling and histone-modifying factors regulate gene expression to control cardiovascular development.